

# DRAFT

**Adverse Health Effects  
Among Community Residents  
Exposed to the Mayflower Oil Spill**

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## Introduction

Starting on March 29, 2013, the Pegasus Pipeline, owned and operated by ExxonMobil, suffered a 20-foot rupture and released substantially more than 100,000 gallons of Wabasca Heavy Crude (diluted bitumen) in the contiguous neighborhood and lake in Mayflower, Arkansas. (BL to add more here)

## Background and Experience

I am an occupational and environmental health physician and epidemiologist with more than 38 years of experience in this field. I received a Bachelor of Science degree from Tufts, a Master of Public Health degree from Harvard, and a Doctor of Medicine degree from Cornell. I completed residencies in Internal Medicine and Preventive Medicine. I am board-certified in both Internal Medicine and Occupational Medicine, and licensed to practice medicine in Massachusetts and Connecticut.

I have worked as a medical epidemiologist for the Centers for Disease Control; as a tenured professor at the University of Massachusetts Medical School, where I founded and directed the Occupational Health Program; and as a director of international health programs and projects. I am an Adjunct Professor of Public Health at Tufts University School of Medicine, where I have directed the Introduction to Environmental and Occupational Health course since 1993.

I have written more than 200 journal articles and book chapters and edited 18 books, including six editions of the textbook *Occupational and Environmental Health*. I have served as president of the American Public Health Association. I have received several awards from professional organizations.

I have clinically evaluated thousands of individuals who had developed, or were at risk of developing, adverse health effects due to environmental and/or occupational exposures. My curriculum vitae is attached as Attachment A.

## Methodology

I reviewed the following information concerning the pipeline rupture of the Mobil Pipe Line Company Pegasus Pipeline System, Patoka to Corsicana Segment, in Mayflower, Arkansas, which began on March 29, 2013:



ExxonMobil Material Safety Data Sheet for Wabasca Heavy Crude Oil  
 Cenovus Energy, Inc., Material Safety Data Sheet for Heavy Crude Oil/Diluent Mix  
 Baker Hughes Material Safety Data Sheet for WAW3049 Water Treatment Additive  
 Continental Products Material Safety Data Sheet for Hydrochem C-135VT  
 Failure Investigation Report  
 Mayflower Pipeline Incident Map  
 Photographs of oil spill  
 Map of plaintiffs' locations in relation to oil spill  
 Letter to The Honorable Ed Markey from Theresa M. Fariello, Vice President, Washington Office, Exxon Mobil Corporation, dated May 28, 2013  
 Letter to Edwin Quinones (U.S. Environmental Protection Agency) from Richard Byrne, Assistant Chief Attorney, Environmental & Safety Law, Exxon Mobil Corporation, dated April 8, 2013  
 Letter to Edwin Quinones (U.S. Environmental Protection Agency) from Richard Byrne, Assistant Chief Attorney, Environmental & Safety Law, Exxon Mobil Corporation, dated April 10, 2013  
 A one-page memorandum concerning the release, which was prepared by Duncan Firm  
 A two-page document entitled "Notes on Chemical Exposure in Mayflower," prepared by Duncan Firm

In addition, I reviewed the following materials from the Center for Toxicology and Environmental Health LLC concerning air sampling done soon after the release:

1. 40435 - Conway, AR: ExxonMobil - Summary of Air Monitoring Conducted by CTEH, March 29, 2013 1700 - March 29, 2013 2359
2. Air Sampling and Monitoring Work Plan, Mayflower Pipeline Incident: Prepared on behalf of: ExxonMobil Pipeline Company, Mayflower, AR, April 1, 2013
3. 40435 - Conway, AR: ExxonMobil - Summary of Air Monitoring Conducted by CTEH, April 02, 2013 - 24 hour period
4. 40435 - Conway, AR: ExxonMobil - Summary of Air Monitoring Conducted by CTEH, April 10, 2013

To determine general causation regarding the association between petroleum oil and adverse health effects, I performed three literature searches to identify relevant articles in the medical and scientific literature:



Petroleum oil (and oil spills) and adverse health effects  
Adverse health effects associated with specific components  
of petroleum oil  
Psychological effects of oil spills and other chemical  
releases

I reviewed each article individually. I also applied the Bradford Hill principles to the bodies of relevant medical and scientific literature to determine general causation between exposure to petroleum oil (including oil spills) and its constituent chemicals and adverse health effects.

For each of the 36 plaintiffs, I reviewed relevant deposition testimony and available medical records. I conducted telephone interviews of the 27 adult plaintiffs; for the nine minor plaintiffs, I interviewed their mothers. I performed a differential etiology analysis, considering alternative explanations for the plaintiffs' symptoms. I considered latency. I synthesized all of this information to develop my specific causation opinions.

## **Results**

### **Plaintiffs' Symptoms**

Plaintiffs reported one or more of the following symptoms:

- Headache
- Dizziness or lightheadedness
- Eye symptoms, including irritated, burning, watering (tearing), and/or itchy eyes
- Sinus problems, including sinus congestion and/or sinus pressure
- Nasal symptoms, including nasal irritation, burning nose, sneezing, nasal congestion, rhinorrhea (runny nose), and/or nosebleeds
- Abnormal taste
- Throat symptoms, including sore throat, burning throat, and/or irritated throat
- Voice impairment
- Lower respiratory symptoms, including shortness of breath (or difficulty breathing), cough, wheezing, chest congestion, chest/lungs burning, and/or bronchitis symptoms
- Gastrointestinal symptoms, including nausea and/or vomiting and abdominal discomfort, including abdominal cramps
- Loss of appetite
- Diarrhea
- Stomach discomfort



Hemorrhoid symptoms  
Anxiety and/or depression  
Symptoms of seasonal allergies  
Skin rash  
Fatigue  
Difficulty sleeping  
Worsening of multiple sclerosis

Onset of symptoms occurred shortly after plaintiffs were exposed to airborne chemicals from the release.

None of the plaintiffs had underlying medical conditions or other contemporaneous exposures that could solely account for their symptoms.

**Chemicals Reported on Material Safety Data Sheets**

ExxonMobil Material Safety Data Sheet for Wabasca Heavy Crude Oil

Reportable hazardous substance or complex substance  
    Petroleum crude oil  
Hazardous constituent(s) contained in complex substance  
    Benzene  
    Cyclohexane  
    Ethyl benzene  
    Hydrogen sulfide  
    N-hexane  
    Naphthalene  
    Polynuclear aromatic hydrocarbons  
    Sulfur  
    Toluene  
    Xylenes

Cenovus Energy, Inc., Material Safety Data Sheet for Heavy Crude Oil/Diluent Mix

Hazardous ingredients of material  
    Crude oil  
    Hydrocarbon diluent  
    Benzene  
    Hydrogen sulphide (sulfide)

Baker Hughes Material Safety Data Sheet for WAW3049 Water Treatment Additive

Composition/information on ingredients  
    Methanol  
    Quaternary ammonia compounds



Continental Products Material Safety Data Sheet for Hydrochem  
C-135VT

Hazardous ingredient  
Methyl alcohol

**Chemicals Detected in Air Monitoring**

March 29, 2013

Benzene  
Hydrogen sulfide  
Sulfur dioxide  
Volatile organic compounds

April 2, 2013

Benzene  
Volatile organic compounds

April 10, 2013

Multiple chemicals, including:  
Acetone  
Benzene  
Cyclohexane  
Heptane  
Hexane  
Isopropyl alcohol  
Toluene  
*m,p*-xylenes

**Opinions**

Based on my review of the cited plaintiff-specific information, my review of the relevant medical and scientific literature and my application of the Bradford Hill Principles to that literature, my education and training, and my experience working in occupational and environmental medicine and epidemiology for more than 38 years, I hold the following opinions, with a reasonable degree of medical and scientific probability:

**General causation:** Exposure to petroleum oil and its constituent chemicals can cause all of the following:

Headache  
Dizziness or lightheadedness  
Eye symptoms, including irritated, burning, watering  
(tearing), and/or itchy eyes  
Sinus problems, including sinus congestion and/or sinus  
pressure



Nasal symptoms, including nasal irritation, burning nose, sneezing, nasal congestion, rhinorrhea (runny nose), and/or nosebleeds

Abnormal taste

Throat symptoms, including sore throat, burning throat, and/or irritated throat

Voice impairment

Lower respiratory symptoms, including shortness of breath (or difficulty breathing), cough, wheezing, chest congestion, chest/lungs burning, and/or bronchitis symptoms

Gastrointestinal symptoms, including nausea and/or vomiting and abdominal discomfort, including abdominal cramps

Anxiety and/or depression

Skin rash

Fatigue

Difficulty sleeping

**Specific causation:** The plaintiffs' symptoms listed on Attachment B were caused by their exposure to the oil spill in Mayflower, Arkansas, which began in March 2013.

I reserve the right to amend or modify this report as further information may become available.



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**BL to add**

#### *Hexane*

**BL to add**

#### *Heptane*

**BL to add**

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BL to add

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